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Transfusion medicine and blood banking education and training for blood establishment laboratory staff – A review of selected countries in Africa

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Abstract

Background—Avoidable human error is a significant cause of transfusion adverse events.

Adequately trained, laboratory staff in blood establishments and blood banks, collectively blood facilities, are key in ensuring high-quality transfusion medicine services. Gaps in transfusion medicine education and training of laboratory staff exist in most African countries. We assessed the status of the training and education of laboratory staff working in blood facilities in Africa.

Study design and methods—A cross-sectional study using a self-administered pilot-tested questionnaire was performed. The questionnaire comprised 26 questions targeting six themes. Blood facilities from sixteen countries were invited to participate. Individually completed questionnaires were grouped by country and descriptive analysis performed.

Results—Ten blood establishments and two blood banks from eight African countries confirmed the availability of a host of training programs for laboratory staff; the majority of which were syllabus or curriculum guided and focused on both theoretical and practical laboratory skills development. Training was usually pre-planned, dependent on student and trainer availability and delivered through lecture-based classroom training as well as formal and informal on the job training. There were minimal online didactic and self-directed learning. Teaching of humanistic values appeared to be lacking.

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Conclusion—We confirmed the availability of diverse training programs across a variety of African countries. Incorporation of virtual learning platforms, rather than complete reliance on didactic, in-person training programs may improve the education reach of the existing programs. Digitalization driven by the COVID-19 pandemic may provide an opportunity to narrow the knowledge gap in low and middle-income countries.

Keywords

Education; training; blood establishments; blood banks; blood facilities; transfusion medicine; online learning

1. INTRODUCTION

Blood transfusions save the lives of patients daily; however, the risks and adverse events associated with transfusion remain concerns. Human error is a significant cause of transfusion mortality^{1,2}, yet is often avoidable through improved education and system re-design³. Although the past century has presented the world with more medical advances than previously thought possible, these advances have not solved the problem of human error.⁴ One approach to minimize transfusion errors is to ensure that blood establishment and blood bank staff are equipped with sound theoretical knowledge, practical laboratory skills, and professional behaviour that enable them to perform their tasks and responsibilities with high standards of quality.

Global deficiencies in transfusion medicine (TM) education for medical professionals have been described; these education deficiencies are notably magnified in Africa and other low and middle-income countries (LMICs).^{5–8} In many African countries, blood transfusion has been practised since the 1940s, and in the urban areas of some countries, transfusion rates are comparable to the Western world.⁹ However, civil war and political instability in the 1970s saw a gradual decline in basic social and health services, including in the provision of safe, quality blood transfusion services.¹⁰ The HIV epidemic further drew global attention to these deficiencies with several international communities e.g. the United States Department of Health & Human Services (US HHS)/Centers for Disease Control and Prevention (CDC), the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) and European Union (EU) projects, extending help to improve blood transfusion services.¹⁰ Despite these efforts, gaps and challenges including lack of skilled human resources, equipment deficiencies and inadequate funding persist in many countries in Africa.¹¹ Although TM education and training in LMICs have improved over the years, it is generally still insufficient to maintain an adequate blood safety standard.⁷ Furthermore, educational approaches in TM vary widely between world regions and countries.⁷ Robust, fit for purpose TM education programs at an early phase of education and practice of all health professionals involved in the vein-to-vein chain are advocated.^{6,7} Approaches to teaching and learning have evolved over the years, and currently there is a growing platform of e-learning tools and a diverse array of TM education programs that could contribute to the development of quality, skilled laboratory staff across wide regions.¹² The Corona virus disease 2019 (COVID-19) pandemic has brought with it unique learning opportunities for the healthcare sector. Virtual means of

teaching, educating, and sharing knowledge have become more popular and acceptable, promising to contribute to a better future healthcare system.¹³

There is a paucity of data on the status of education and training of medical laboratory professionals in general, and in particular, laboratory staff working in blood collection and transfusion related facilities. The aim of this study was to gain perspective on the status and scope of TM or blood banking education for laboratory staff working in blood establishments and blood banks, here further collectively referred to as blood facilities, in countries within the African continent. This report aims to inform future educational intervention studies and programs focused on improving global TM education and training in achieving high-quality transfusion care in African countries.

2. MATERIALS AND METHODS

A comprehensive self-administered survey was developed to gain insight into the TM education and training of blood establishment and blood bank laboratory staff in Africa.

2.1 Generation of the knowledge assessment questions

The questionnaire was developed by the authors of this report (clinicians, hematopathologists and medical laboratory technologists), five of whom work at, and are involved with the education and training of laboratory staff at blood facilities in LMICs in Africa. Face validation of the questionnaire was performed by members of the AABB's Global Transfusion Forum (GTF) Education Subcommittee, who reviewed and revised the questionnaire based on the broad feedback. The GTF Education Subcommittee includes membership from, among others, LMICs. The final questionnaire, developed in English, comprised 26 questions directed at six broad themes namely: (i) types of training programs offered, associated qualifications and duration of programs; (ii) training structure, delivery format, facilities and capacity; (iii) learning areas covered; (iv) assessment of learning; (v) review/evaluation of training programs; and (vi) opportunities for continuous learning and professional development. The questionnaire was developed and powered in SurveyMonkey® (www.surveymonkey.com). Definitions for syllabus and curriculum were provided in the questionnaire to ensure consistent application of the survey between sites. The complete text of the questionnaire is available in Appendix A. Fifteen blood establishment laboratory staff participated in the pilot evaluation of the proposed survey tool. Participants in the pilot evaluation were from LMICs and were either involved with the training of laboratory staff in their facilities or had previously received TM/blood banking training. Minor changes were made to the questionnaire following this evaluation; data gathered from the survey validation was not used in the final analysis.

2.2 Survey delivery and distribution

Blood facilities from sixteen African countries were invited to participate in the study. Respondent-driven sampling (RDS), a network-based sampling method, was applied to reach a convenience population sample and respondents were encouraged not only to participate in the survey themselves but also request their contacts from the target population to participate.¹⁴

Potential participants were selected based on the researchers having contact details of individuals in the respective countries who were able to complete the survey themselves and/or direct the survey to appropriate individuals within their respective countries for completion. To develop a comprehensive overview of participating countries, responses were sought from multiple persons within the same institute and country. Names and emails of participants were obtained from the GTF members' networks. Participants provided online informed consent prior to completing the survey. The survey was distributed in February 2019. Email reminders were sent in March 2019. Data collection was concluded in July 2019. Survey data were extracted from SurveyMonkey®; each survey response was individually reviewed, the results captured in Microsoft Excel® and descriptively analyzed. Responses received from multiple participants from the same facility and country were collated and collectively grouped to represent the respective countries' overall training systems and practices. Ethical approval for conducting the survey was obtained from the Institutional Review Board (IRB) of the University of California, San Francisco.

2.3 Definitions

'Blood establishment' refers to any structure, facility or body that is responsible for any aspect of the collection, testing, processing, storage, release and/or distribution of human blood or blood components when intended for transfusion or further industrial manufacturing.¹⁵ 'Hospital blood bank' refers to a hospital unit which stores and distributes and may perform compatibility tests on blood and blood components exclusively for use within hospital facilities, including hospital based transfusion activities.¹⁶ 'Blood facility' in this article refers to all organizations that provide any blood collection and transfusion related service and therefore includes both blood establishments and blood banks. 'Syllabus' was defined as 'an outline or summary of the topics to be covered in a subject or course and is usually part of a bigger curriculum. 'Curriculum' was defined as the overall content taught in an educational system or a course; it is comprehensive and includes the learning objectives, teaching methodologies, assessment methods and resources required for teaching and learning. 'In-house based training' was defined as training that is developed within an establishment, for the establishment and facilitated by individuals within the establishment.

3. RESULTS

Sixteen countries in Africa were invited to participate in the survey (Supplementary Table 1) and Completed survey responses were received from twelve facilities (ten blood establishments and two blood banks) from eight countries altogether representing six lower-middle income countries (Algeria, Egypt, Ghana, Kenya, Lesotho, Tanzania), one low-income country (Malawi), and one upper-middle income country (South Africa), as per the World Bank classification of countries by income (Table 1). The number of respondents from each country ranged from 1 to 43 for a total of 55 completed surveys. The results showed that similar functions took place in most respondent facilities and generally comprised blood collection, grouping and viral screening, processing, storage and distribution of donated blood, and the crossmatch issue of blood for transfusion.

3.1 Theme 1: Training programs offered, associated qualifications and training duration

A variety of TM/blood banking training programs were offered by the facilities in the eight respondent countries (Table 2). Except for Lesotho and Tanzania, in-house certificate training programs were facilitated in all other respondent countries. College/university graduates were trained in the majority institutions, however, the qualifications/certification varied from country to country. Most of the training programs were components of broader training programs offered by the countries' higher education institutions, which culminated in a specific qualification. A unique finding in South Africa was the recruitment of high school graduates, who were trained in-house to become blood bank technicians and laboratory assistants. The duration of the training programs varied depending on the category of students trained and ranged from less than one year to longer than four years (data not shown). In some facilities, TM/blood banking training was not limited to laboratory staff. Blood transfusion specific training of doctors took place in Algeria, Ghana and South Africa. Algeria also provided blood transfusion training to pharmacy students and Ghana reported the training of nurses.

3.2 Theme 2: Training structure, delivery format, facilities and capacity

Except for respondent blood establishment in Lesotho, where the training of students was guided by the students' tertiary education institutions, and in Malawi, where the training was primarily in-house based; all other respondent institutions indicated that their training programs were largely syllabus or curriculum guided programs (Table 3). Additionally, training programs in Ghana and South Africa were guided by their countries' health regulatory bodies.

The training was structured and pre-planned in the majority of the facilities and took place mainly when the students were available for training. A combination of teaching and learning formats existed in the various institutions and comprised lecture-based training in the laboratory, practical laboratory skills training, classroom-based training, structured on the job training and informal on the job training, with the respondent blood establishment in Lesotho indicating only provision of informal on the job training. One facility in Ghana reported online teaching and learning approaches.

Training was mainly facilitated by the laboratory supervisors and managers in the majority of the blood facilities. Additionally, respondents from Algeria, Ghana, South Africa and Tanzania indicated that they had dedicated trainers or educators that were specifically designated for the training of laboratory staff. Dedicated training laboratories or training centres were available in both blood establishments in South Africa, one facility in Ghana and one facility in Kenya. In South Africa, training of newly appointed laboratory staff was planned and structured by the institutions' dedicated training departments and the training was primarily facilitated by training officers and took place in the training laboratories. On successful completion of the pre-readiness laboratory training courses, students or trainee laboratory staff then entered the live laboratory environment for extended on the job training. The respondents from Malawi, Tanzania and one facility in Ghana indicated that training was dependant on available funding which could vary year to year.

3.3 Theme 3: Learning areas covered

Almost all blood facilities indicated adequate to extensive theoretical training taking place in their facilities, with only Tanzania reporting limited theoretical training (Table 4). Similarly, most countries indicated adequate inclusion of practical laboratory skills training, with only Egypt reporting limited practical laboratory skills training. Training focused largely on the technical and scientific knowledge aspects of blood transfusion, practical laboratory testing, good laboratory practice, safety and quality. All respondents' training programs included training rotations in blood donor clinics, blood processing centres, inventory and distribution centres, donor blood grouping laboratories and transmissible disease testing laboratories. Rotations in blood banks or crossmatching laboratories were included in the training programs in Algeria, Egypt, Ghana, Malawi and South Africa and rotations in the antenatal testing laboratories were reported by Algeria, Egypt, Ghana and South Africa. Rotation through specialized serology or reference laboratories were reported by Algeria, Ghana, Malawi and South Africa; and molecular testing laboratory rotations took place in Algeria, Egypt and South Africa. Only Algeria and South Africa reported training rotations in human leucocyte antigen (HLA) testing laboratories. While many of the facilities provided education on humanistic aspects such as ethical and professional values; the role and value of laboratory staff in healthcare and patient care were covered in some countries, and only Algeria, Ghana and South Africa reported teaching on good collaborative practice with healthcare partners.

3.4 Theme 4: Assessment of learning

Formal assessment of learning took place in all the respondent countries, with written assessments being the most common method of knowledge assessment (Table 4). Practical laboratory skills assessments were also in place in most of the facilities. Online assessments were not employed by any of the facilities.

3.5 Theme 5: Review/Evaluation of training programs

The training programs in the respondent facilities in Algeria, Malawi and South Africa were reviewed annually. In Egypt, Ghana, Kenya and Tanzania training programs were reviewed as required, and the respondent blood establishment in Lesotho indicated that the training program was reviewed by the higher education institutions.

3.6 Theme 6: Continuous or ongoing learning

Opportunities for ongoing or continuous learning were available in all the respondent blood facilities and learning were either in the form of continuous professional development (CPD), continuous medical education (CME) or refresher learning programs. Online learning systems or approaches for continuous learning were not utilized in any of the facilities in the eight respondent countries.

4. DISCUSSION

Our study is one of the first to review the laboratory training programs of blood facilities in Africa. The results of this study showed that a host of TM/blood banking training programs for various categories of laboratory staff were available in all eight respondent countries.

The majority of the training programs were syllabus or curriculum guided and focused on both theoretical knowledge as well as laboratory practical skills development. Training was usually pre-planned, mainly took place when the students were available for training, and the delivery of training included a combination of formats ranging from lecture-based classroom training to formal and informal on the job training. Compared to the other respondent countries, South Africa had a more capacitated and a defined approach to orientating new laboratory staff and developing readiness of students or trainees, in their dedicated training facilities, prior to placing them in the live laboratory environment. Almost all of the respondent countries provided in-house certificate linked training programs, however, in several facilities the training programs were components or extensions of broader education programs that led to undergraduate or postgraduate qualifications conferred by the higher education institutions.

Training in some facilities was dependant on funding availability (Ghana, Malawi and Tanzania), the absence of which may result in limited or no training for varying periods of time. Budget limitations, inadequate facilities and insufficient numbers of experienced trainers, especially in LMICs make it impossible to meet the training needs of large numbers of staff, particularly if scattered over wide geographical areas.¹⁷

Goal 4 of the 2016–2030 United Nations Sustainable Development Goals program focuses on quality education stating ‘*Ensure inclusive and equitable education and promote lifelong learning opportunities for all*’;¹⁸ the observations from this study illustrates a major gap in the development of this goal in several of the respondent countries. In response to the TM education challenges in Africa, *Eichbaum et al*⁷, recommend the need for funding agencies like the PEPFAR and others to award funding for the development of assets to sort online TM education in the continent.

Although this study showed that training and assessment of learning occur in a variety of settings, there is a significant absence of online learning and assessment across all the respondent countries. Well-developed, targeted online or e-learning programs can provide an almost unlimited number of students with access to a wide pool of educational material, at a time and place convenient to the learner. The Africa Society for Blood Transfusion (AfSBT), through educational partnerships with the International Society for Blood Transfusion (ISBT), has established online learning platforms in support of TM education in the African regions. Additionally, members of the AfSBT have access to ‘ISBT Education’ and the wider ISBT online learning environment.¹⁹ In keeping with global advancements, especially since the outbreak of the COVID-19 pandemic, African blood facilities may consider establishing the necessary infrastructure and resources to access online learning platforms. Gaining access to existing international TM online learning resources may help offset development costs in ways that may make such investments more affordable. Online learning not only supports independent self-directed learning, but can offer relief to those blood facilities that depend on funding for training and have limited manpower to facilitate in-person training. It must be noted that establishment of e-learning platforms may be more possible for centralized blood facilities and less so in the many smaller transfusing facilities where internet access is limited; pointing to the potential need for blood establishments to take on a larger role in TM outreach training. The COVID-19 pandemic has led to an

increased awareness and application of technology-based learning approaches with opportunities to meet international experts and gain real world skills from our homes.¹³ Certainly, in-person training is necessary and cannot be eliminated; training approaches that include blended learning formats should therefore be considered. Such blended programs have the potential to reach large audiences across large geographical areas with great success as was seen in the University of Toronto Transfusion Camp experience.²⁰ Participation in such programs need to be complemented by continued medical education to ensure maintenance and update of knowledge and skills in the field.

Another key aspect is the need to ensure the development of well-rounded laboratory staff that can serve as efficient partners and patient advocates. This study showed that training programs in the respondent countries focused primarily on the technical aspects of blood banking practice. Training directed at the development of humanistic values and behaviours such as ethics and professionalism, the role and value of the laboratory and laboratory staff in healthcare as well as good collaborative practice with healthcare partners appeared to be lacking. Such values and behaviours are sometimes perceived as common sense and therefore overlooked as important areas of learning.²¹ Humanistic values such as professionalism are however not necessarily inherent in all, and must be deliberately taught and entrenched in students for translation into practice.^{22,23} Developing the technical expert role as well as strengthening the advisory, communicator and collaborator roles of laboratory staff are necessary to enable them to function successfully as partners in a multi-disciplinary healthcare team. Education and training programs for laboratory staff therefore need to be all encompassing with educational focus on development of their multiple roles and functions, all underpinned by ethical, professional and leadership values, not as a once off learning episode, but as a continuum of ongoing learning.

We also found that program or curriculum renewal took place primarily when the need arose. Educational curricula guide teaching and learning and should not be fragmented, static or outdated.²⁴ Instead, they should be evolving to accommodate new developments, ensure up to date knowledge, skills and competence, cognizant of the extraordinary pace of global knowledge production.

As in other areas of medical advancements, the TM/blood banking field has also specialized into diverse knowledge areas.²⁵ Curricula guiding the education and training of blood establishment and blood bank laboratory staff must keep pace with such developments. Existing educational programs require regular evaluation, as the sustainability of any profession relates directly to the success of graduates in education programs related to that profession.⁴

The availability of training programs for blood facility laboratory staff, although variable, can be seen as a potential positive indicator of the quality of transfusion service delivery in these African countries. Several studies have previously noted the relationship between appropriate training for laboratory staff and the outcomes of proficiency programs.^{26,27} Lack of and decentralisation of training were noted as key factors contributing to poor laboratory practices. Continuous monitoring of the availability, type and quality of training programs have been cited as directly impacting the safety and quality of transfusion services.²⁸

Furthermore, understanding the nature and potential deficiencies within such training programs, may assist in developing strategies to improve the quality of transfusion services delivered within a particular setting.

Our study is subject to several limitations. First, the survey was self-administered, and no formal definitions were provided for the terms “extensive, adequate and limited’ knowledge and skills training, leading to potential variability in interpretation by individual participants. Second, although the survey highlighted the various types of training taking place in the eight respondent countries, it did not provide insight into the quality of training. Third, the survey was electronic and required internet access. Potential respondents may not have had the electronic resources and tools to take the survey. This may have resulted in only better resourced countries responding; resulting in respondent bias with countries that did not respond due to lack of resources, also having less resources for training programs. Also, of the fifty five responses, fifty three responses were from blood establishments and only 2 were from hospital blood banks. The survey therefore provides little information on the level or quality of education in transfusing facilities in Africa, pointing to the need for further evaluation of education at hospital blood bank level. As a result of these limitations, it is not clear to what degree these findings may be generalized to the rest of Africa; this study may have underestimated the existing TM educational gaps in the continent. A wider response from more countries and more blood banks in Africa would have provided a broader overview of teaching and learning taking place in the continent. Despite the limitations, this study is, to our knowledge, the first of its kind, providing valuable insights into TM training activities in place in some countries in Africa and it is a step towards directing focus at improving TM education and training in LMICs, not only in Africa but elsewhere.

5. CONCLUSION

Blood establishment and blood bank laboratory staff contribute to saving lives on a daily basis. Competency-based education and training of laboratory staff is essential in ensuring the safety of blood transfusions, and should therefore be given priority and focused attention. Training programs must be well structured and fit for purpose, encompassing all areas of competency development that enable translation of learning into practice, not as a once off experience, but as a continuum of ongoing learning and practice. The availability of diverse training programs in facilities across a variety of African countries bode well for the future of blood transfusion services across the continent; however, reliance on didactic, in-person training programs in the face of serious resource constraints may hamper further advances. Development and evaluation of alternative digital training methods may help to overcome some of the challenges faced in the development of TM education programs in Africa and elsewhere. In fact, post-COVID-19 will provide a ‘golden’ opportunity to change and narrow the existing knowledge gap in the low-and middle income world.²⁹

6. RECOMMENDATIONS

We recommend that a standardized competency framework model be developed to guide the competency focussed development of laboratory professionals working in blood facilities, in line with their many roles and their scope of practice, encompassing structured learning

opportunities starting at an early phase of study and continuing throughout the learning and development journey of laboratory staff. Such a framework could serve as the central core and blueprint, guiding the development of knowledge, skills, attitudes, behaviours and leadership of blood establishment and blood bank laboratory staff, across the African continent and beyond.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Appendix A

AABB GLOBAL TRANSFUSION FORUM

SURVEY: Transfusion Medicine / Blood Banking education and training for laboratory staff

We are asking you to take part in a research study being done by Elena Nedelcu MD and Sara Bakhtary MD at the University of California, San Francisco in collaboration with members of the AABB Global Transfusion Forum – Education Subcommittee. Being in this study is optional. If you choose to be in the study, you will complete a survey. This survey will help us learn more about the education of blood transfusion laboratory technicians and technologists. The survey will take about 10 to 15 minutes to complete. You can skip questions that you do not want to answer or stop the survey at any time. We will keep your answers confidential and will not share your personal information with anyone outside the research team. Questions? Please contact Vanitha Rambiritch at vanitha.rambiritch@sanbs.org.za. If you have questions or concerns about your rights as a research participant, you can call the UCSF Institutional Review Board at 01-415-476-1814. If you want to participate in this study, click the Next button to start the survey.

SURVEY AIM: To evaluate the scope and structure of transfusion medicine / blood banking education and training for laboratory staff across the various countries.

This questionnaire should be completed by:

- Individuals directly or indirectly involved in the training of laboratory staff. Supervisors, managers and other senior level laboratory staff.
- Trainee / student laboratory staff or individuals who are completing, or have completed any training in transfusion medicine / blood banking.

Should you wish to participate in this survey, please click the **NEXT** button.

1. Demographic Information

Name of
participant
(Optional)

Country of residence

City of residence

Current position

Name of current work area

Name of facility where transfusion medicine/blood banking training takes place

2. How many blood transfusion services are there in your country?

- ☐ One
- ☐ Two
- ☐ Three to five
- ☐ Six to ten
- ☐ More than ten
- ☐ Other (please specify)

3. Select the various functions that take place in the facility that you are working or training at. Please select all options that apply.

Blood donation

Blood grouping of donated blood Disease or viral testing of donated blood

Processing of whole blood into blood components

Crossmatching or compatibility testing for transfusion Storage of blood for transfusion

None of the listed functions

Other (please specify)

4. The facility where you work, or train in is referred to as:

- ☐ Blood Transfusion Service (BTS)
- ☐ Blood Bank
- ☐ Hospital blood bank
- ☐ Hospital laboratory
- ☐ Hospital laboratory Services
- ☐ Specialized laboratory
- ☐ University
- ☐ College
- ☐ I do not know
- ☐ Other (please specify)

5. I am involved in the training of laboratory staff / students in the field of blood banking / transfusion medicine; or I am part of a facility that provides blood banking / transfusion medicine training.

- ☐ Yes
- ☐ No

TRAINING STRUCTURE

6. What type of transfusion medicine / blood banking training is offered at your facility? Please select all options that apply.

- | | |
|---|---|
| <input type="checkbox"/> Undergraduate program | <input type="checkbox"/> Regulatory body such as the Health Professions Council prescribed training program |
| <input type="checkbox"/> Postgraduate program | <input type="checkbox"/> In-house formal training program |
| <input type="checkbox"/> Learnership program | <input type="checkbox"/> In-house informal training program |
| <input type="checkbox"/> Internship training / clinical laboratory training | <input type="checkbox"/> My facility does not offer training programs |
| <input type="checkbox"/> Nationally accredited training program | <input type="checkbox"/> I do not know |
| <input type="checkbox"/> In-house accredited training program | |
| <input type="checkbox"/> Other (please specify) | |

7. What category of individuals are trained in your facility? Please select all options that apply.

- ☐ High school graduates with no tertiary level qualification
- ☐ College/University graduates
- ☐ Medical laboratory interns that require experiential learning as part of their study programme
- ☐ My facility does not offer training programs
- ☐ I do not know
- ☐ Other – please specify

8. What type of qualification can individuals obtain on successful completion of the training programs at your facility? Please select all options that apply.

<input type="checkbox"/> No qualification	<input type="checkbox"/>
<input type="checkbox"/> In-house certificate awarded by the facility that provided the training	<input type="checkbox"/> Master's degree
<input type="checkbox"/> Nationally accredited certificate	<input type="checkbox"/> It allows laboratory personnel to register with a regulatory body as a registered practitioner to work in the laboratory
<input type="checkbox"/> Nationally accredited diploma	<input type="checkbox"/> I do not know
Nationally accredited degree / Honors degree	
<input type="checkbox"/> Other (please specify)	
<input type="text"/>	

9. On successful completion of the respective training programs and the required assessments / examinations what qualification status or title is awarded to the successful candidates? Please select all options that apply.

<input type="checkbox"/> Technician	<input type="checkbox"/> Laboratory assistant
<input type="checkbox"/> Technologist	<input type="checkbox"/> I do not know
<input type="checkbox"/> Scientist	
<input type="checkbox"/>	
<input type="text"/>	
Other please specify)	

10. Do **trainee / student laboratory staff** have to be registered with a national regulatory body such as the Health Professions Council during their training period?

☐ Yes

☐ No

☐ It is optional

☐ I do not know

11. Do **trained and qualified laboratory staff** have to be registered with a national regulatory body such as the Health Professions Counsel?



Yes



No



It is optional



I do not know

TRAINING FORMAT AND CONTENT

12. What guides the training at your facility? Is the training:

- | | |
|---|---|
| <input type="checkbox"/> Syllabus based (A syllabus is an outline or summary of the topics to be covered in a subject or course. Syllabus is usually part of a bigger curriculum) | <input type="checkbox"/> Guided or prescribed by the Regulatory Body such as the Health Professions Council |
| <input type="checkbox"/> Curriculum based (Curriculum refers to the overall content taught in an educational system or a course. It is comprehensive and it includes the learning objectives, teaching methodologies, assessment methods and resources required for teaching and learning.) | <input type="checkbox"/> Not guided by any plan or document |
| <input type="checkbox"/> In-house training plan based | <input type="checkbox"/> I do not know |
| <input type="checkbox"/> Other (please specify) | |

13. In which format (s) is training offered in your facility? Please select all options that apply.

- ☐ Lecture based training in the laboratory
 ☐ Structured on the job training
☐ Practical laboratory skills training
 ☐ Informal on the job training
☐ Online / web based learning
 ☐ I do not know
☐ Classroom based training (where students / trainees are taken out of the laboratory to attend training in a classroom type of environment)
☐ Other (please specify)

14. How is the training at your facility structured? Please select all options that apply. Is the training:

- ☐ Structured and pre-planned
 ☐ Takes place when funding is available
☐ Takes place when the student / trainee is available for training
 ☐ I do not know
☐ Takes place only when someone is available to provide training
☐ Other (please specify)

15. Does the training include the **theoretical / knowledge** aspects of blood banking / transfusion medicine.

- ☐ Yes, extensive theoretical training is covered
 ☐ No
☐ Yes, adequate theoretical training is covered
 ☐ I do not know
☐ Yes, limited or small amounts of theoretical training is covered
☐ Other (please specify)

16. Does the training include the **practical laboratory skills** aspects of blood banking / transfusion medicine

- ☐ Yes, extensive practical laboratory skills training included
 ☐ No
☐ Yes, adequate practical laboratory skills training included
 ☐ I do not know
☐ Yes, little practical laboratory skills training included
☐ Other (please specify)

17. List the **name/s of the transfusion medicine / blood banking training program/s** offered at your facility according to the duration of training listed in the options below.

Less than one month	
3 - 6 months	
4 - 8 months	
9 - 12 months	
One year	
18 months	
2 years	
3 years	
4 years	
More than 4 years	
Other - Please specify.	

- 18.** Areas of learning covered: Do the blood banking / transfusion medicine training programs for laboratory staff or students include teaching of the following learning areas. Please select all options that apply.

<input type="checkbox"/> Technical / Scientific knowledge of blood transfusion	<input type="checkbox"/> Role and value of the laboratory and laboratory staff in healthcare / patient care
<input type="checkbox"/> Practical laboratory testing	<input type="checkbox"/> Good collaborative practice with healthcare partners
<input type="checkbox"/> Good laboratory practice	<input type="checkbox"/> Quality and safety
<input type="checkbox"/> Ethical values	<input type="checkbox"/> Stock inventory training
<input type="checkbox"/> Professional values	<input type="checkbox"/> Distribution and delivery of blood and blood products
<input type="checkbox"/> Other (please specify)	

TRAINING RESOURCES

- 19.** Does your facility have a dedicated training laboratory or training centre for training?

☐ Yes
 ☐ I do not know
 ☐ No
 ☐ Other (please specify)

- 20.** Do the various blood banking / transfusion medicine training programs include rotation training in the following work areas? Select all options that apply.

- ☐ Blood donor clinic
- ☐ Blood processing
- ☐ Inventory and distribution of blood
- ☐ Donation testing – Donor grouping
- ☐ Donation testing - Viral testing
- ☐ Antenatal testing
- ☐ Specialized serology laboratories
- ☐ HLA testing laboratories
- ☐ Molecular testing laboratories
- ☐ Blood banks - crossmatching laboratories
- ☐ I do not know
- ☐ Other (Please specify)

21. Who facilitates the training?

- | | |
|--|--|
| <input type="checkbox"/> Trainers / Educators specifically designated and responsible for training | <input type="checkbox"/> Laboratory Managers |
| <input type="checkbox"/> General laboratory staff | <input type="checkbox"/> Appointed on-the-job trainers |
| <input type="checkbox"/> Laboratory Supervisors | <input type="checkbox"/> I do not know |
| <input type="checkbox"/> Other (please specify) | |

ASSESSMENT AND EVALUATION

22. Is the knowledge of students formally assessed / examined?

- ☐ Yes
- ☐ No
- ☐ Sometimes
- ☐ I do not know

23. How is assessment of learning conducted? Please select all options that apply.

- | | |
|---|--|
| <input type="checkbox"/> Written examination | <input type="checkbox"/> Continuous knowledge assessments (Weekly /Monthly /Quarterly written tests) |
| <input type="checkbox"/> Oral / Verbal assessment | <input type="checkbox"/> Weekly /Monthly /Quarterly tests of particular skills |
| <input type="checkbox"/> Portfolio based assessment - Portfolio of evidence | <input type="checkbox"/> On-line assessments |
| <input type="checkbox"/> Practical laboratory skills assessments | |
| <input type="checkbox"/> Other (please specify) | |

24. How often are the training programs reviewed?

- ☐ Annually
- ☐ When the need arises
- ☐ Never been reviewed
- ☐ I do not know
- ☐ Other (please specify)

25. Do the trainees / students work unsupervised?

- ☐ Yes
- ☐ No
- ☐ Sometimes

26. Are there opportunities for ongoing / continuous learning in the form of:

- ☐ Continuous professional development (CPD) or continuous medical education (CME)
- ☐ Online learning
- ☐ Refresher programmes
- ☐ There are no continuing learning programs
- ☐ There are no continuing learning programs
- ☐ Other (please specify)

Thank you for taking the time to complete this survey

Abbreviations

GTF	Global Transfusion Forum
LMICs	Low and middle-income countries
TM	Transfusion medicine

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Table 1:

Respondent countries, institutions and blood transfusion services offered per respondent country

Respondent country Responding institution (N responses received)	*World Bank country classification	Blood transfusion related services offered
Algeria Blood Transfusion Centre of Oran (1)	Lower-middle income	Blood collection, grouping & viral marker testing Blood component production Blood storage Crossmatching/compatibility testing
Egypt Shabrawishi Hospital – Giza (1)	Lower-middle income	Blood collection, grouping & viral marker testing Blood component production Blood storage Crossmatching/compatibility testing Other: Pathogen reduction and irradiation
Ghana Southern Area Blood Centre – Accra (1) Northern Area Blood Centre – Tamale (1) Korle Bu Teaching Hospital – Accra (1) Komfo Anokye Teaching Hospital – Kumasi (1)	Lower-middle income	Blood collection, grouping & viral marker testing Blood component production Blood storage Crossmatching/compatibility testing
Kenya Kenya National Blood Transfusion Service (2)	Lower-middle income	Blood collection, grouping & viral marker testing Blood component production Blood storage Crossmatching/compatibility testing
Lesotho Lesotho Blood Transfusion Service (1)	Lower-middle income	Blood collection, grouping & viral marker testing Blood component production
Malawi Malawi Blood Transfusion Service (2)	Low income	Blood collection, grouping & viral marker testing Blood component production Blood storage Crossmatching/compatibility testing
South Africa South African National Blood Service (20) Western Cape Blood Service (23)	Upper-middle income	Blood collection, grouping & viral marker testing Blood component production Blood storage Crossmatching/compatibility testing Other: Irradiation; External quality assessment (EQA)
Tanzania Tanzania National Blood Transfusion Service (1)	Lower-middle income	Blood collection, grouping & viral marker testing Blood component production Blood storage

* World Bank classification of economies – June 2020. <https://www.databank.worldbank.org/data/download/site>

Table 2:

Training programs offered, associated qualification/certification and categories of students trained at the respondent institutions in the eight respondent countries

Country	Training programs offered	Qualifications and certification linked to the training programs	Categories of students trained
Algeria	In-house training programs Internships Nationally accredited programs Undergraduate programs Postgraduate programs	In-house certificate Accredited certificate / diploma Regulatory registration	Medical laboratory interns College / University graduates Doctors Pharmacy students
Egypt	Postgraduate program	Accredited certificate / diploma	Medical laboratory interns
Ghana	In-house training programs Internships Nationally accredited programs Undergraduate programs Postgraduate programs	In-house certificate Accredited certificate / diploma Regulatory registration Nationally accredited degree	Medical laboratory interns College / University graduates Doctors Nurses
Kenya	In-house training programs Internships Nationally accredited programs Undergraduate programs	Nationally accredited diploma Nationally accredited degree / Honours degree In-house certificate awarded by the facility that provided the training In-house certificate Accredited certificate / diploma Nationally accredited degree	Medical laboratory interns College / University graduates
Lesotho	Internships	No qualification	Medical laboratory interns College / University graduates
Malawi	In-house training programs Internships Nationally accredited programs Undergraduate programs	In-house certificate awarded by the facility that provided the training In-house certificate	Medical laboratory interns College / University graduates
South Africa	In-house training programs Internships Nationally accredited programs Undergraduate programs	Nationally accredited certificate It allows laboratory personnel to register with a regulatory body as a registered practitioner to work in the laboratory In-house certificate Accredited certificate / diploma Regulatory registration	Medical laboratory interns College / University graduates Doctors High school graduates
Tanzania	In-house training programs Internships Nationally accredited programs	No qualification	Medical laboratory interns

Table 3:

Training program description, capacity and facilities by responding country

Country	Training guided by	Structure of training	Training delivery format	Training facilitated by	Dedicated training facilities
Algeria	Syllabus Curriculum In-house plan-based	Structured and pre-planned Subject to student / trainee availability Subject to trainer availability	Lecture based training in the laboratory Practical laboratory skills training Classroom based training Structured on the job training Informal on the job training	Designated trainers/ educators General laboratory staff Laboratory Supervisors/ Managers Appointed on-the-job trainers	No
Egypt	Syllabus Curriculum	Structured and pre-planned	Lecture based training in the laboratory Practical laboratory skills training	Laboratory Supervisors/ Managers	No
Ghana	Syllabus Curriculum In-house plan-based Guided/prescribed by regulatory body	Structured and pre-planned Subject to student / trainee availability Subjected to funding availability	Lecture based training in the laboratory Practical laboratory skills training Classroom based training Structured on the job training Informal on the job training Online / Web based learning (Korle Bu Teaching Hospital)	Designated trainers/ educators Laboratory Supervisors/ Managers Appointed on-the-job trainers	No (3 institutions) Yes (1 institution)
Kenya	Syllabus Curriculum In-house plan-based	Structured and pre-planned Subject to student / trainee availability	Lecture based training in the laboratory Practical laboratory skills training Structured on the job training	General laboratory staff Laboratory Supervisors/ Managers	No (1 institution) Yes (1 institution)
Lesotho	Guided by the student's base training institution	Subject to student / trainee availability	Informal on the job training	General laboratory staff Laboratory Supervisors/ Managers	No
Malawi	In-house plan based	Subject to student / trainee availability Subjected to funding availability	Lecture based training in the laboratory Practical laboratory skills training Structured on the job training	Laboratory Supervisors/ Managers Appointed on-the-job trainers	No
South Africa	Syllabus Curriculum In-house plan-based, Guided/prescribed by regulatory body	Structured and pre-planned	Lecture based training in the laboratory Practical laboratory skills training Classroom based training Structured on the job training	Designated trainers/ educators General laboratory staff Laboratory Supervisors/ Managers Appointed on-the-job trainers	Yes
Tanzania	In-house plan-based	Structured and pre-planned Subjected to funding availability	Practical laboratory skills training Classroom based training Structured on the job training Informal on the job training	Designated trainers/ educators General laboratory staff Laboratory Supervisors/ Managers Appointed on-the-job trainers	No

Table 4:

Learning areas covered and assessment methods applied in the eight respondent countries

	Algeria	Egypt	Ghana	Kenya	Lesotho	Malawi	South Africa	Tanzania
Learning areas covered								
Technical / Scientific knowledge of blood transfusion	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Practical laboratory testing	Yes	Yes (Limited)	Yes	Yes	Yes	Yes	Yes	Yes
Good laboratory practice	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Ethical values	Yes	No	Yes	Yes	No	Yes	Yes	Yes
Professional values	Yes	No	Yes	Yes	No	Yes	Yes	Yes
Role and value of the laboratory staff in healthcare	Yes	No	Yes	Yes	No	Yes	Yes	Yes
Good collaborative practice with healthcare partners	Yes	No	Yes	No	No	No	Yes	No
Quality and safety	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock inventory training	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distribution and delivery of blood and blood products	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Assessment methods								
Written examination	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Oral / Verbal assessment	Yes	No	Yes	Yes	Yes	No	Yes	No
Portfolio based assessment	Yes	No	Yes	Yes	No	No	Yes	No
Practical laboratory skills assessments	Yes	No	Yes	Yes	No	Yes	Yes	Yes
Continuous knowledge assessments	Yes	No	Yes	No	No	No	Yes	No
Periodic tests of particular skills	Yes	No	Yes	No	No	No	Yes	No
On-line assessments	No	No	No	No	No	No	No	No